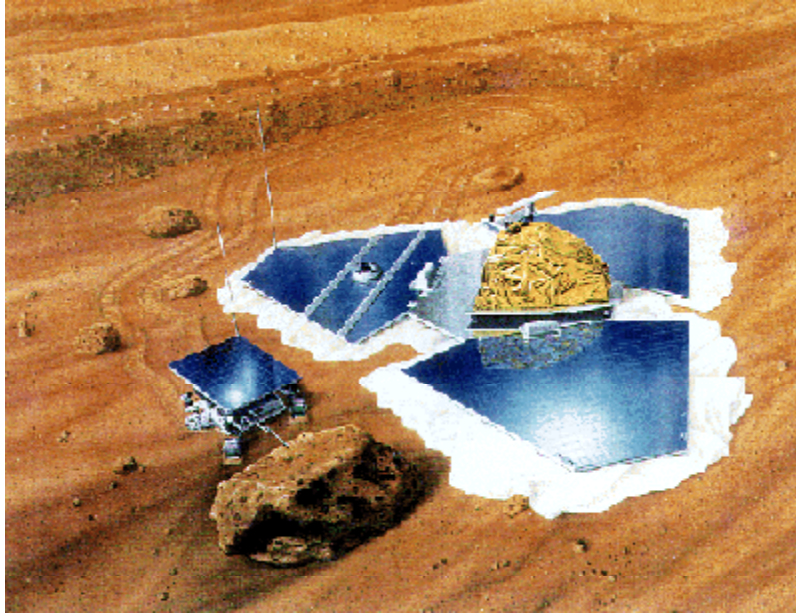


# Lewis Mars Pathfinder Microrover Experiments



*Artist's concept of Mars Pathfinder.*

The NASA Lewis Research Center has a prime role in the Mars Pathfinder mission, the first in the series of Discovery-class missions, sponsored by NASA Headquarter's Office of Space Science. Mars Pathfinder is an engineering proof-of-concept mission intended to demonstrate the successful deployment of scientific instruments, including a small rover, on a planetary body and to gain engineering design information for follow-on systems. The mission was launched in December 1996 and will land on Mars on July 4, 1997.

The Jet Propulsion Laboratory (JPL), which is heading the Pathfinder mission, requested Lewis' aid in developing a means to obtain, using the microrover, information on the abrasiveness and adherence properties of Mars soil and dust. Consequently, Lewis developed three flight experiments for the Pathfinder Microrover. In addition, Lewis' Plum Brook Station tested the Pathfinder airbag landing system for JPL.

Lewis' experiments consist of a Wheel Abrasion Experiment (WAE) and two Materials Adherence Experiments (MAE). The Wheel Abrasion Experiment will gain soil abrasion information by observing rover wheel wear. The center section on one of the rover's six wheels is coated with thin layers of nickel, aluminum, and platinum. Changes in the metal layers' reflectance due to wear will be detected by a photocell. The two adherence experiments consist of (1) a solar cell experiment (MAESC), which compares the power output over time of a rover array cell in a "dirty" configuration (transparent dust cover closed) with the output for a "clean" configuration (dust cover opened briefly to direct illumination), and (2) a quartz crystal monitor experiment (MAEQCM), which measures the mass of dust accumulating with time and correlates this with the power output. This

project has been conducted entirely in-house with Lewis and support service contractor personnel.

The development of the experiments was initiated in December 1993, and the flight hardware was delivered to JPL for integration with the microrover in May 1995 and July 1997, where the engineering model checked out successfully with the JPL rover. Integration with the flight unit rover was concurrent with the rover construction. Principal investigators and engineers from Lewis will continue their involvement through the Pathfinder flight and operations phases.

In addition to providing needed information on Mars surface properties, this project will demonstrate Lewis' ability and commitment to NASA's new business philosophies, which are intended to enhance NASA program efficiencies. The project features an in-house, multidirectorate team; low cost; a quick response time; and a cooperative effort with another center (JPL).

## **Bibliography**

Landis, G.A., et al.: Development of a Mars Dust Characterization Instrument. IAF Paper 95- U.4.09, AIAA, 1995.

Jenkins, P.P.; and Landis, G.A.: A Rotating Arm Using Shape-Memory Alloy. 29th Aerospace Mechanisms Symposium. NASA CP-3293, 1995, pp. 167-171.

Siebert, M.W.; and Kolecki, J.C.: Electrostatic Charging of the Pathfinder Rover. AIAA Paper 96-0486, 1996.